

1959
Vol. 1

CLEANER AIR

by

Helen B. Shaffer

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No. 2
Jan. 14

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RICHARD M. BOECKEL, *Editor*

Editorial Research Reports
1156 Nineteenth Street, N.W.
Washington

CLEANER AIR

STUDIES linking polluted air over American cities with the growing incidence of lung cancer and other serious diseases have added urgency to widespread demands for stronger laws to clean up the atmosphere. The 86th Congress will be asked to extend and enlarge the federal research and technical assistance program instituted under temporary legislation enacted in 1955 and due to expire next June 30. The Governors' Conference has called for a more intensive attack on air pollution at all levels of government; similar recommendations were made by a National Conference on Air Pollution convened in Washington last November by the Public Health Service. At least 11 states have recently enacted their first air pollution control laws or strengthened existing statutes. Meanwhile, regulatory action by local communities has been growing tougher.

Stronger control laws, however, are not the complete answer to this complex problem. Los Angeles, which has had stringent control measures for a decade, continues to suffer periodically from severe smog conditions. Like other American communities, it lacks the technical data needed to develop a control program that will give full protection to its inhabitants without at the same time restricting economic growth.

The public has tended to blame industry almost exclusively for contaminating the air. Now it is coming to be recognized that the responsibility must be shared by the ordinary citizen himself. The way he heats his home, disposes of domestic refuse, and drives and cares for his car may have a good deal to do with the degree of air pollution. In some communities—Los Angeles, for example—emissions from automobile exhausts are a more serious source of contamination than discharges from industrial plants.

Despite stepped-up abatement efforts at many industrial plants, atmospheric contamination in urban centers has

been getting worse. Studies of air samples, collected by the U.S. Public Health Service from several hundred co-operating localities, show that the air in American cities in general is becoming dirtier, and that the larger the city the dirtier the air. The sampling program, utilizing a device which sucks air through a filter capable of capturing minute particles, measures only solids. It is believed that noxious gases and vapors also are going into the atmosphere at an increasing rate.

At least 10,000 American cities are reported to have air pollution problems, largely man-made. This condition is an inevitable consequence of industrial expansion and the growth of metropolitan areas. At least 60 per cent of the people of the United States now live in the country's 180 metropolitan centers. It is expected that two-thirds of the population will be so concentrated by 1975, at which time residents of metropolitan areas "may be exposed to more than double the present volume of urban contaminants."¹

Surgeon General Leroy E. Burney of the U.S. Public Health Service warned last November that national growth trends, especially advances in industrial technology, were creating a "dynamic transition in our environment" which would have unknown effects on individual and community health. Pollutants are currently being found in the atmosphere which were not present in industrial discharges of a few years ago; processes and products unheard of before World War II are producing the new contaminants. Future developments can be expected to introduce additional pollutants.

COSTS OF AIR CONTAMINATION; HAZARDS TO HEALTH

The public is just beginning to comprehend the enormous toll of air contamination. Estimates of the annual cost have risen from \$10 per capita in 1949 to \$65 per capita today; another estimate places the total cost to the nation at \$7.5 billion a year.² The cost figures represent estimated expenditures by industry to reduce pollution;³ expenditures for laundry and cleaning services; deteriora-

¹ Council of State Governments, *Air Pollution, Summary Report to the Governors' Conference*, May 1958, p. 3.

² The 1949 estimate was made by Weldon B. Gibson, then chairman of the Department of Business and Industrial Economics at Stanford University Research Institute. The current per capita figure is attributed to Haldon A. Leedy, director of Armour Research Foundation in Chicago. The \$7.5 billion total was cited at the air pollution conference in November 1958 by Reuben G. Gustavson, president of Resources for the Future, Inc., Washington, D. C.

³ Such expenditures are necessarily reflected in the cost of goods and services to consumers.

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tion of property values; cost of replacing corroded metal; expenditures for repainting soiled buildings; damages awarded in air pollution suits; public expenditures for control activities; and medical expenses incurred by individuals made ill by contamination of the air.

Public concern over air pollution is centered mainly on its effects on health, knowledge of which is still extremely limited. The U.S. Public Health Service pointed in a report on Nov. 10, 1958, to growing evidence that air pollution contributes significantly to the incidence of cancer of the lungs, trachea, esophagus, and stomach. Although full proof was lacking, the service said there was reason "to suspect that breathing [and swallowing] polluted air may have long-term effects on health, surpassing in importance anything we can yet prove."

Present evidence suggesting implication of air pollution in cases of cancer and, to some extent in cases of heart disease, is statistical; that is, the statistics show that these diseases are most prevalent in areas of greatest air pollution. Similar evidence has formed the basis for the strong suspicion that cigarette smoking contributes to lung cancer. Public Health studies show an even closer correlation between lung cancer and air pollution than between lung cancer and cigarette smoking; urban rates of lung cancer are higher than non-urban, even when there is no difference in smoking habits.

It has long been known that air pollution in an acute form can kill. Smog caused respiratory disorders among thousands of persons in the Meuse Valley of Belgium in 1930 and at Donora, Pa., in 1948 and took 60 lives in the first instance and 20 in the second. London has had several experiences with death-dealing smog, notably in 1948, 1950, 1952 and 1955. During a week of intense smog in December 1952, deaths in London exceeded the normal number by 4,000.

New medical findings raise the possibility that even apparently harmless levels of air pollution may have damaging effects if a person breathes the soiled air over a considerable period. British doctors have long attributed the high rate of chronic bronchitis in their country to the cumulative effect of breathing polluted air. There is now evidence that exposure to air pollution early in life may

produce deleterious effects long after an individual has moved to a place where the atmosphere is cleaner. Studies of New Zealanders, for example, show a higher rate of lung cancer among men who emigrated from England than among natives.

Los Angeles smog so far has apparently caused no more serious physical damage than temporary irritation of the eyes. However, California scientists recently expressed fear that the smog there might contain sulphuric acid mist, a substance similar to that found in the killer-fogs of London and Donora.

CONFLICTS OF INTEREST IN ANTI-POLLUTION ACTION

Results of studies on the effects of air pollution on health are strengthening demands for more rigorous regulation of the sources of pollution. Sen. Thomas H. Kuchel (R-Calif.), leading advocate in Congress of air pollution control legislation, warned the National Conference on Air Pollution that some of the suggested legal remedies would have "heavy consequences" for the automobile and petroleum industries. "None of us," he said, "should lightly regard a wave of suggestions that certain types of motor fuels be prohibited by ordinance or regulation." Kuchel added, however, that "We cannot overlook the resolutions now reaching Washington urging federal promulgation of standards governing the emission of hydrocarbons and other products of combustion."

Los Angeles County authorities already have power to order a shutdown of industrial plants and a cessation of motor traffic when smog reaches a specified degree of intensity. Such measures are costly to business and industry and may be fatal to small enterprises. Even if the shutdowns are of short duration, a community subject to such measures loses its attractions for industry, business, and tourists. "Unchecked continuance of atmospheric contamination," said Kuchel, "undeniably and eventually will halt the growth and progress of any community as surely as a Chinese wall around its perimeter."

Zoning codes which would prohibit location of industrial plants in otherwise favorable locations, unless better means of controlling pollution at its source are developed, may have to be imposed. Radical innovations in traffic engineering have been suggested as another possible means of

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protecting the atmosphere against pollution if other means of reducing discharges from automobile exhausts are not found.

INDUSTRY'S FEAR OF FUTURE CONTROL MEASURES

A number of participants in the air pollution conference held last Nov. 18 and 19 cautioned against hasty enactment of stringent measures which might have economically damaging consequences for local business, or which might require heavy expenditures without appreciably alleviating local pollution. Communities were warned in particular that it was unwise for one locality to copy the control system and standards of another without first determining the probable effects on the local situation and the welfare of the community generally. Each locality was said to present a unique situation requiring a "tailor-made" control program.

Industry spokesmen showed concern over the effect of control measures on their operations. Some made a strong point of the fact that non-industrial sources were a major factor in pollution; others deplored the growing practice of bringing damage suits against industry. Howard F. Roderick, vice president of the International Minerals and Chemical Corporation, said that "After years of being regarded as the sole culprit in air pollution, industry is now found to be no more at fault than some of its principal accusers." Roderick added that, in view of current efforts by industrial enterprises to reduce air pollution, he failed "to see where restrictive legislation and litigation can contribute to progress." He urged government to take industry in as "equal partner" in the search for solutions of pollution problems and asked the public to show "confidence and patience which permits the painstaking work of research to continue." Max D. Howell, executive vice president of the American Iron and Steel Institute, described air pollution operations in that industry and said he hoped "that we shall be permitted to work out the solutions to our problems without being hampered by restrictive legislation which can have little grounding in reality until the state of the abatement art is more advanced than it is today."

The *Wall Street Journal* on Sept. 18 termed air pollution the principal public relations problem for many companies. It reported that company officers were particularly worried

over the effect on public opinion of attempts to obtain compensation in court for air pollution losses. An American Cyanamid representative was quoted as having said: "Public relations records will confirm how often apparently obscure pollution litigation in a single plant location will be publicized in the press of a thousand communities across the nation. For a corporation doing business in many of these communities, the lesson is . . . filled with harsh implications."

Farmers frequently file suit for damages to crops alleged to have been caused by air pollution. A hundred Oregon farmers, for example, sued an aluminum company not long ago for several million dollars. The case was settled out of court, and the company spent \$2.5 million for equipment which it was hoped would prevent additional lawsuits. Damage suits brought by Florida citrus growers against phosphate plant operators several years ago spurred installation of millions of dollars worth of pollution control equipment.

Changes in the Air Pollution Problem

AIR POLLUTION is a much more complex and far-reaching problem now than it was a decade or two ago. Before World War II, atmospheric contamination caused concern in only a relatively few areas of concentrated industrial activity and was apparent largely in the form of soot, grime, and smoke. Most persons had little real fear of air pollution and tended to accept the smoky pall over a city as a necessary concomitant of economic vitality. Beginning about 30 years ago, certain metropolises, notably Pittsburgh and St. Louis, undertook smoke abatement programs which helped considerably to clear the air. Improved conditions were brought about mainly by substituting oil and gas for coal as fuel. But coal smoke still darkens many American communities and is prevalent in most European industrial cities.

Today's air pollution problem concerns not only visible emissions but also unseen and odorless gases, such as the oxides of sulphur, nitrogen and carbon, and particles of

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imperceptible size. When it was recognized that pollution of the atmosphere in sufficient concentration and under certain meteorological conditions could cause acute illness and even death, the public became aroused. Atomic developments subsequently made every citizen aware of the lethal atmospheric potentialities in the modern world.

APPORTIONMENT OF THE BLAME FOR POLLUTION

Air pollution was defined at the November conference as "the presence in the ambient atmosphere of substances put there by the activities of man in concentrations sufficient to interfere directly or indirectly with his comfort, safety, or health, or with the full use and enjoyment of his property." The "activities of man" in this connection include industrial as well as domestic activities. The chief of the federal air pollution engineering program has said that "No one aspect of community life can be charged with the full or principal responsibility for the air pollution problem in our communities."⁴

Flue-fed garbage and refuse incinerators in apartment houses are a major source of pollution in many large cities. Backyard burning of refuse, permitted in numerous communities, contributes measurably to the pollution total. Almost every industry produces air pollution to some degree. The pollution may affect only a particular area downwind from an industrial installation, or it may be a community-wide problem resulting from mixture of a variety of pollutants from many sources.

Tracking down pollutants and relating them to specific deleterious effects is a difficult, costly and often frustrating task. The interaction of certain pollutants on other pollutants and their reaction to natural forces like wind and sunlight have much to do with the ultimate effects. A research specialist in air pollution⁵ told the conference in Washington that "In a truly community-wide problem, the atmosphere gets in such a mess that frequently it is impossible to distinguish one pollutant from another, or to tell where each comes from." According to a federal air pollution official, solid and liquid particles generated by combustion processes, mechanical action and chemical reaction are chiefly responsible for reducing visibility, dam-

⁴ Frank Testlaff, address before New England Health Institute, Storrs, Conn., June 19, 1958.

⁵ Herbert C. McKee (manager of air pollution research for Southwest Research Institute, San Antonio, Tex.)

aging property and injuring animals, while gaseous contaminants are the principal offenders in cases of injury to human health and to vegetation.⁶

The principal pollutants introduced into the air in various amounts by the burning of fuel oil or coal, the combustion of gasoline or diesel oil in automobile engines, the incineration of waste, or other industrial or domestic processes include oxides of sulphur and nitrogen, aldehydes, carbon monoxide, organic vapors ("hydrocarbons"), and solids contained in dust, smoke, condensed fumes, etc.⁷

It has been estimated that if all residences in a metropolitan area of 100,000 population were heated by furnaces using an average grade of bituminous coal, a total of 307,000 pounds of contaminants—solids, oxides of nitrogen and sulphur and various organic substances—would be discharged into the atmosphere daily. If oil were used, the daily amount would be reduced to 42,400 pounds; if gas, the amount would be negligible. In New York City, where more than 30 million tons of coal are burned annually, it is estimated that 1.5 million tons of sulphur dioxide gas and more than two million tons of sulphuric acid go into the atmosphere every year. Backyard burning of trash in ordinary incinerators, in a hypothetical community of 100,000, would produce a daily discharge of 46,800 pounds of common pollutants. If the refuse were burned at dumps, the daily discharge would be 50,400 pounds of pollutants.

EMPHASIS ON POLLUTANTS FROM AUTO EXHAUSTS

Automobiles are receiving an unprecedented amount of attention as a major source of air pollution today. In Los Angeles, where industrial plants are under relatively strict air pollution control, the largest remaining producer of smog is said to be the discharge from exhausts of the area's three million automobiles, trucks and buses.

According to the Los Angeles Air Pollution Control District, the atmosphere there on a typical midsummer day receives 1,450 tons of hydrocarbons; more than two-thirds of the total is emitted from gasoline-driven vehicles, more than one-half from private automobiles. The production,

⁶ Andrew H. Rose (chief of engineering research and development for air pollution engineering program at Sanitary Engineering Center in Cincinnati, Ohio), National Conference on Air Pollution, Nov. 19, 1958.

⁷ Leslie A. Chambers (director of research, Los Angeles County Air Pollution Control District), National Conference on Air Pollution, Washington, D. C., Nov. 18, 1958.

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storage, refining, and marketing activities of the petroleum industry contribute directly only 17 per cent of the total.

Around 5,600 tons of carbon monoxide are released into the Los Angeles atmosphere on a similar day—75 per cent from vehicle exhausts and 21 per cent from petroleum refining. Automobiles and trucks contribute one-third of the aerosols and 62 per cent of the inorganic gases which have been identified as pollutants in the Los Angeles area. Leslie A. Chambers, research director of the county's air pollution control district, said last Nov. 18: "Exhausts from automobile engines are by far the largest source of primary air pollutants in Los Angeles County. About 8,600 tons per day of all types of gases, vapors and solids are identified as to source, with the automobile supplying 5,770 tons."

LETHAL DOSES OF POLLUTION; LOS ANGELES SMOG

The total amount and the ratio of pollutants discharged into the atmosphere over a particular area are not the only determinants of how seriously the community suffers from bad air. Much depends on the effectiveness of natural forces in diluting or carrying away the pollutants.

London smog reaches lethal concentrations at times—usually in the cold winter months—because fog which holds the pollutants remains stationary over the city for days at a time. Similar conditions were present at Donora, Pa., in 1948. In both instances, an epidemic of respiratory illness appeared after a few days of unbroken fog and was terminated as soon as the fog was dispelled by rain.

Los Angeles smog contains a combination of pollutants which differs from that in London smog, but both areas suffer from comparable meteorological phenomena. Los Angeles smog, which is most prevalent at midday in hot summer months, occurs when cold air moving in from the sea is trapped by a layer of warm air above and by high mountains which prevent a horizontal escape. The air during a London smog is usually still; in Los Angeles mild breezes cause the polluted air to drift within its area of confinement.

The principal components of London smog—sulphur compounds, particulate matter, and carbon monoxide—combine to cause bronchial irritation, coughing, sometimes nausea, which may be fatal to persons suffering chronic

respiratory or cardiac disorders. The principal components of Los Angeles smog are ozone, organic matter, nitrogen oxides, and carbon monoxide, and its chief effect is to cause irritation of the eyes.

Much research has gone into an effort to isolate the ingredients of Los Angeles smog. It has been found that the characteristic haze over the area and the eye irritation are not caused by the original pollutants, but by the pollutants as altered by the action of sunlight. The high ultraviolet content of sunlight in the area is apparently the final responsible factor.

An important question now before air pollution specialists is whether Los Angeles smog is peculiar to the region or whether other communities may be subjected in time to the same experience. Some experts think that, given appropriate weather conditions, health-damaging smog may occur in other areas where industry and population are concentrated and control measures are inadequate. Communities located near river valleys are considered particularly susceptible. An air pollution research officer from San Antonio pointed out at the conference in Washington:

So far as the entire nation is concerned, the important thing about this [Los Angeles] problem is the warning that it provides about what may happen in other communities. So far, the right combination of circumstances has occurred only on the West Coast to any appreciable degree. However, other cities drive the same kind of cars . . . have power plants, incinerators, buses, and other sources of pollutants; other cities have sunlight and . . . may at times have unfavorable weather conditions. Therefore, there is a very real possibility that population increases and changes in our method of living may in the future produce an unfavorable combination of circumstances in other cities.⁸

Experience gained at Los Angeles may well be helpful in handling any similar situations that arise elsewhere.

⁸ Herbert C. McKee (manager of air pollution research, Southwest Research Institute, San Antonio, Tex.), Nov. 18, 1958.

Action to Reduce Air Contamination

FOCUSING OF ATTENTION on air pollution problems over the past half-dozen years, and the accompanying growth of state and local regulatory action, have led to development and application of many new technical devices and procedures for reducing the amount of contamination for which industrial processes are responsible. The air may be growing more polluted, but it is obvious that conditions would be much worse without the extensive installation of abatement equipment that has followed advances in the technology of air pollution control.

OUTLAYS BY BUSINESS TO CURTAIL AIR POLLUTION

Industry today is reportedly spending \$300 million a year installing and maintaining air pollution control equipment; the equipment business itself has grown into the hundred-million-dollar sales class. The petroleum industry alone has spent more than \$20 million annually for air pollution control in recent years. The investment in control equipment in chemical and fertilizer plants has been reported to total as much as 20 per cent of capital costs in some cases. Business is devoting additional millions to research.

Air pollution from industrial plants can be reduced by shifting operations to a site favoring natural dispersal of contaminants; by introducing changes in equipment, materials and fuels to cut down the volume of deleterious wastes; or by installing devices for collecting, burning, washing, or otherwise disposing of wastes before they reach the atmosphere. Installation of pollution-abatement equipment is the only practical solution in many cases, and such equipment is likely to be costly.

Pollution reduction equipment costing \$2 million was installed in a new Dow Chemical Co. plant at Midland, Mich. Consolidated Edison Company in New York has reported that air pollution control equipment in two new electric generators cost \$5 million for each unit. Expenditures on a giant refinery for Tidewater Oil Co. in Delaware City, Del., included \$7.5 million for air pollution abatement, which represented 4 to 5 per cent of total plant cost. Los Angeles refineries, acting in part to meet requirements of local regulations, have reportedly spent \$33 million in the

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past few years for pollution control apparatus and maintenance and another \$6 million on air pollution research.

Processes are now available for abatement of most known pollutants, but their use is still restricted by the costs involved. The technology of smoke abatement presents few problems today. The technology of limiting dust emissions is well advanced, although some fine dusts continue to resist capture. The most serious current problems concern escape of sulphur dioxide and hydrocarbons into the atmosphere.

Although many industries still let loose a tremendous percentage of sulphur-containing wastes, there have been notable improvements in that respect in the petroleum industry. According to a national survey of refineries, a total of 1,600 tons of sulphur that otherwise would go into the air are being recovered daily. Los Angeles refineries assert that they keep 600 tons of sulphur compounds out of the air every day. A Gulf Coast refinery says its sulphur discharges last year ran at less than 5 per cent of the amount discharged in 1946.

CRITICISM OF EFFORTS OF AUTOMOBILE INDUSTRY

No feasible mechanism has yet been developed to reduce hydrocarbon emissions—major pollutant in Los Angeles smog—from automobile exhausts. Automobile manufacturers have come under the fire of California officials, who assert that current expenditures of \$1 million a year for research on this question are meager in relation to the size of the industry and the seriousness of the problem.

Mayor Norris Poulson of Los Angeles on Dec. 16 accused the automobile makers of a public-be-damned attitude toward air pollution. Several participants in the national air pollution conference a month earlier had taken the industry to task for what they considered a laggard interest in improving automobile exhausts. Harold W. Kennedy, Los Angeles County counsel, said: "Southern California represents a vast market for the motor vehicle manufacturers. One would think that the automobile industry would be gravely concerned and launch an all-out crash program to tame the lung-searing, eye-smarting monster which its ingenuity has unwittingly created." Kennedy found "no substantial evidence that any such all-out program has been activated."

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Secretary of Health, Education and Welfare Arthur S. Flemming announced, Dec. 30, that automobile manufacturers had come to an agreement with the Public Health Service for close cooperation on the auto exhaust problem. The arrangement provides for concentration by the Public Health Service on research into the effects on health of exhaust gases and concentration by the industry on development of effective means of reducing exhaust fumes.

Detroit engineers have been working on several exhaust-cleaning devices which may be installed as standard equipment in the automobiles of the future. One is a muffler attachment containing a chemical that causes vapors to burn as the exhaust stream flows through it. The other is an "afterburner," a kind of combustion chamber in which unconsumed hydrocarbons would be incinerated at high temperature.

These devices are not yet ready for routine insertion in the exhaust pipes of old or new cars. It appears that, at the present stage of development, they might add \$100 to \$350 to the price of a car. No device will be approved for general use until it can be fully demonstrated that it would appreciably reduce the discharge of hydrocarbons, that it would have a reasonable life span, and that it would not interfere with other aspects of automobile operating efficiency and safety.⁹

DEVELOPMENT OF MUNICIPAL POLLUTION CONTROLS

A good deal of activity in air pollution abatement on the part of industrial enterprises has been undertaken for the purpose of meeting the requirements of present and probable future laws, codes, and ordinances governing discharge of obnoxious materials into the air. Public control of air pollution in the United States is largely a local matter; four-fifths of existing air pollution law is municipal and 2,000 communities have some type of legal machinery aimed directly at controlling air pollution.

Most of the regulations are aimed to keep the air free of smoke. Relatively few as yet govern the amount of gases, fumes, and other newer types of industrial emissions.

⁹ Efforts to solve the auto exhaust problem by improving the quality of fuel have proved unsuccessful to date. The Smoke and Fumes Committee of the American Petroleum Institute, which has been working on this problem for a year and a half, has tested numerous experimental mixtures as well as the commercial gasolines. But all types tested have produced exhaust fumes which, when irradiated, inflict the characteristic symptoms of smog, including eye irritation.

Chicago in 1881 became the first city to authorize public regulation of smoke discharge; similar measures were adopted by Cincinnati in the same year and by St. Louis in 1893. By 1912, 23 cities had smoke abatement programs.

The early ordinances set legal limits for emissions of dense smoke and fly ash and prescribed penalties for violations. Recent legislation is based on the principle that more effective air pollution control is obtained by an administrative process which encourages the cooperation of private interests. Typically, the ordinances and regulations provide for issuance of permits for installation of pollution-producing equipment, establish specifications for the quality of fuel to be used, and lay down other requirements based on engineering data.

A recent survey of air pollution abatement control activity, prepared for the Governors' Conference, observed that "Many community enactments are not adapted to local needs" and others "reflect out-dated knowledge and technology." Only a small fraction were said to be in satisfactory operation. An effective local program for control of air pollution costs from 5c to 20c annually per capita, depending on the severity of the pollution problem.

The most elaborate setup is in Los Angeles. The Los Angeles County Air Pollution Control District was established in 1947 to carry out a comprehensive regulatory, enforcement, and research program. Los Angeles forbids installation of pollution-producing equipment without a permit and requires approval of a facility before it is put into operation. Trained inspectors have authority to enter factories and stop the operation of equipment in violation of regulations. Mechanical monitors automatically take air samples over the city day and night. When pollution levels approach the danger point, an emergency warning system goes into action. Key industrial plants are required to have emergency radios to receive shutdown orders and the entire enforcement staff of the area as well as all communications media are alerted by direct telephone, teletype and radio broadcasts. The district maintains staff scientists for continuing research, which now centers largely on the auto exhaust problem.

Los Angeles County banned use of backyard incinerators in 1957. The Los Angeles Board of Supervisors in Novem-

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ber 1958 approved a rule making mandatory the use of natural gas instead of fuel oil for industrial combustion during periods of intense air pollution. Both steps were taken despite considerable controversy as to whether they were necessary. Opponents of the fuel rule contended that it would inflict needless hardship on the fuel oil industry. When an effective auto exhaust cleaning device is perfected, Los Angeles can be expected to be among the first communities to require its installation in all motor vehicles.¹⁰

New York City created a Department of Air Pollution Control in 1952 to make rules governing air pollution, including requirements for the construction, alteration, and conversion of pollutant-producing equipment. The city has instituted a licensing system and armed itself with authority to shut down equipment operating without a permit.

STATE ACTION TO PROMOTE POLLUTION ABATEMENT

Nine states have enacted legislation on air pollution control within the past dozen years. California led off in 1947 with a law authorizing all of the state's counties to set up control programs. Anti-pollution statutes followed in Kentucky in 1952, in Massachusetts and New Jersey in 1954, in Oregon in 1956-57, and in Delaware, Florida, New York, and Washington in 1957.

Most of the state laws aim to encourage local control efforts while reserving the right of the state to act on special problems. Delaware, Florida and New Jersey empower state bodies to promulgate and enforce rules and regulations, but New York State's Air Pollution Control Board promulgates rules only for areas of special need. Oregon gives its board power to issue rules and compliance orders. Kentucky establishes state-wide standards for air pollution control but makes enforcement a matter of local option. Massachusetts permits local agencies to control atmospheric pollution, subject to approval of the state department of health. California, Ohio, and Washington limit state programs to research, technical assistance, and advisory functions.

All of the above states except Massachusetts have set up special state air pollution control agencies; Massachu-

¹⁰ A resolution introduced in the Los Angeles city council, Dec. 31, proposed petitioning the state legislature to prohibit sales of new or old automobiles in California after Jan. 1, 1961, unless equipped with anti-pollution devices. A bill of this sort, introduced in the legislature on Jan. 8, would apply only in air pollution control districts after July 1, 1961.

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sets places responsibility in the state's department of health. States other than these nine can tackle the general air pollution problem through exercise of police powers to eliminate public nuisances and protect the public health. Some states, like Missouri and Pennsylvania, have state smoke abatement legislation.

Because pollution emanating from one community may contaminate the air in a neighboring community, the laws of certain states make it possible to apply joint controls. The California statute was amended in 1955 to authorize adjoining counties to establish and operate a single control district. The Massachusetts department of health is authorized, on the complaint of one community, to issue regulations applicable in a neighboring community. Oregon law provides for transfer of any complaint to the local agency having jurisdiction over sources of the pollution.

Regulation across state borders is not as far advanced. There is talk of a need for interstate compacts on air pollution. New Jersey and New York in 1955 authorized the Interstate Sanitation Commission to study the interstate aspects of air pollution in the metropolitan New York-New Jersey area and propose legislative solutions. The commission recognized the interstate character of air pollution and recommended creation of an interstate agency to deal with it. Walter S. Cooper, the commission's general counsel, has suggested that an Eastern Regional Air Pollution Control Board be established by the Middle Atlantic and New England seaboard states to develop a comprehensive program for that whole region. "The entire area from Massachusetts to Virginia is blanketed by a single air mass," Cooper said. "Any contribution of air pollutants to that mass may well affect the entire area."¹¹

FEDERAL GOVERNMENT'S ANTI-POLLUTION PROGRAM

The present federal air pollution program is conducted by the U.S. Public Health Service. It dates from an act of Congress, approved July 14, 1955, which authorized appropriations not to exceed \$5 million annually for each fiscal year through 1960 to enable the Public Health Service to (1) undertake research, independently or in cooperation with other agencies, on means of controlling air pollution; (2) encourage cooperative activity by state and local governments for pollution abatement; (3) collect and disseminate

¹¹ Address, National Conference on Air Pollution, Washington, D. C., Nov. 19, 1958.

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nate information on the subject; (4) conduct investigations and make surveys on specific problems confronting a state or local government; and (5) make grants and enter into contracts for research, training and demonstration projects. No federal agency has authority to promulgate air pollution standards, to issue regulations, or to engage in the enforcement of any existing anti-pollution measure.

Because the greatest need in air pollution control at the time the law was enacted was to acquire more technical knowledge of the causes and effects of pollution, as a basis for practical control measures, the federal program put major emphasis on research. Four-fifths of the total of \$12.4 million thus far appropriated has been devoted to research; the remainder has gone for technical assistance and training grants.

One of the principal activities has been operation of a National Air Sampling Network; 230 stations around the country collect air samples which are sent to the Sanitary Engineering Center at Cincinnati for identification, measurement and analysis. More than 40 research grants have been made to universities and other institutions. The Public Health Service attempts to coordinate the findings of research in the various areas of study involved in air pollution: medical, chemical, meteorological, epidemiological, mechanical, agricultural, engineering, and so on. Research projects under way at the Sanitary Engineering Center include development and improvement of field sampling equipment for continuous monitoring of pollutants; development of analytical methods; evaluation of available control procedures; and studies of the relationship between atmospheric variables and community pollution levels.

Federal activities in air pollution are considered so necessary to the eventual conquest of the problem that virtually every agency concerned, public or private, favors their continuation and expansion. The national air pollution conference recommended indefinite extension of the federal act and stepped-up research on the health effects of air pollution. Congress was asked to put no ceilings on future appropriations because "an engineering or medical research breakthrough may occur at any time, in which case increased funds might be desirable."

